
Six New Bamboos (Poaceae: Bambusoideae) from the Venezuelan Guayana

Emmet J. Judziewicz, Gerrit Davidse, and Lynn G. Clark

Department of Botany, Birge Hall, University of Wisconsin,
Madison, Wisconsin 53706, U.S.A.;

Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, U.S.A.;
Department of Botany, Bessey Hall, Iowa State University, Ames, Iowa 50011, U.S.A.

The grass flora of the Guayana Highlands is a rich one and includes many poorly known bamboos (Poaceae: Bambusoideae). Twenty-one genera and 75 species of bambusoid grasses are known from the region, including the following six species newly described for the *Flora of the Venezuelan Guayana*. Judging from the intriguing sterile but as yet unidentifiable bamboo collections that remain in herbaria, more novelties may be expected from this region in the future.

Arberella venezuelae Judziewicz & Davidse, sp. nov. TYPE: Venezuela. Amazonas: Dept. Atabapo, 2 km abajo del Salto Yureba del Bajo [Río] Ventuari, 4°03'N, 66°02'W, localmente frecuente en el sotobosque, 100–120 m, 24 Mar. 1982, *F. Guánchez 1667* (holotype, MO; isotype, VEN). Figure 1.

Bambusa herbacea *Arberella bahiensis* Soderstrom & Zuloaga affinis, sed laminis longioribus (8–10.5 cm) latioribus (2.3–3.5 cm).

Caespitose perennial. Culms 40–60 cm tall, unbranched above the base; internodes glabrous or with fine, retrorse pubescence in lines; nodes slightly swollen, flaring, with a few fine, retrorse hairs. Leaves 5–7 per complement; sheaths striate, the margins finely and retrorsely hispid, the back glabrous or finely hispid, especially near the summit; ligules ca. 0.5 mm long, membranous; pseudopetioles ca. 2 mm long, turgid, brown, sparingly short-hispid; blades 8–10.5 cm long, 2.3–3.5 cm wide, lanceolate-ovate, asymmetrically cuneate at the base, acuminate at the apex, with 6–10 main nerves, the upper surface glabrous, the lower surface glabrous to puberulent, slightly whitened. Inflorescences both terminal and axillary, 3–6 produced at each node, contracted and few-flowered, the base included in the leaf sheath, up to 2 cm long, terminating in a female spikelet and bearing 3–5 short-pedicelled male spikelets below, or uncommonly, a short branchlet bearing 2 male spikelets present below. Female spikelets borne

on clavate terminus of the rachis; glumes persistent, lanceolate, membranous-papyraceous, unequal, glabrous; lower glume 9–12.5 mm long, 7–9-nerved, attenuate, prolonged into a flexuous awn up to 3 mm long; upper glume 8–10 mm long, 5–7-nerved, acuminate to subaristate; floret 6–6.7 mm long, 2.3–2.5 mm wide, fusoid-ellipsoid, coriaceous, shiny, whitish; lemma with base prolonged into a squat, peglike internode 0.4–0.7 mm long, the apex acute, glabrous on the back, the margins, apex, and especially the base densely bearded with short, crisp, glassy, matted hairs; palea glabrous or with some matted hairs near the apex; lodicules 3, ca. 0.3 mm long, truncate; stigmas hispid. Caryopsis not seen. Male spikelets borne on filiform pedicels, 4–5 mm long, linear-lanceolate, hyaline, early deciduous; glumes absent; lemma 3-nerved; lodicules 3, ca. 0.3 mm long; stamens 3, the anthers 2–2.5 mm long.

Distribution. Endemic to lowland forests in the upper Río Orinoco valley, Amazonas, Venezuela.

Additional specimens examined. VENEZUELA. AMAZONAS: Dept. Atabapo, Salto Yureba, Caño Yureba, Bajo Ventuari, 4°03'N, 66°01'W, 120–150 m, 24 Oct.–4 Nov. 1981, *Delascio & Guánchez 11032* (MO); Mavaca, Alto Río Orinoco, hierba de sitios sombríos, Jan. 1970, *Aristeguieta & Lizot 7416* (NY).

Arberella Soderstrom & Calderón (Olyreae) is a rarely collected genus of six species that ranges from Costa Rica to Brazil (Rondônia and Bahia) in wet, lowland forest shade (Soderstrom & Calderón, 1979; Soderstrom & Zuloaga, 1985). Only ten collections have been made in South America. As in many genera of the Olyreae, it is difficult to delimit species due to the nearly invariant spikelet morphology, yet variable leaf blade morphology is present in different populations. Nevertheless, the three collections of the new Venezuelan species consistently have the largest leaf blades (8–10.5 cm long, 23–35 mm wide) yet seen in *Arberella*. The only other South American congeners have much smaller leaves: 4–5.5 cm long, 8–15 mm wide in *A. flaccida* (Doell)

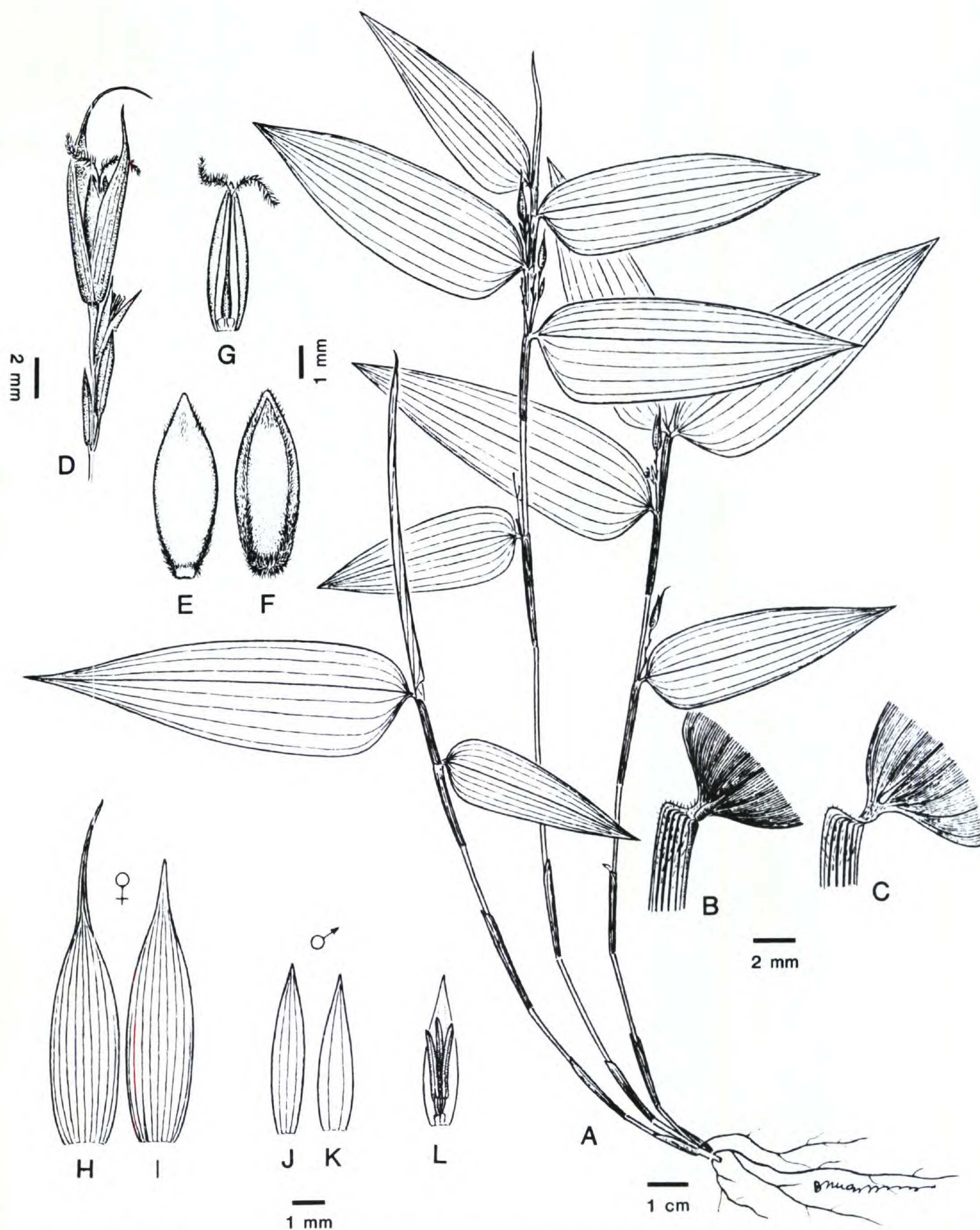


Figure 1. *Arberella venezuelae* (Delascio & Guánchez 11032, MO). —A. Habit. —B, C. Two views of leaf pseudopetiole area. —D. Inflorescence showing terminal female and lateral male spikelets. E–I. Female spikelets. —E, F. Floret, dorsal and ventral views. —G. Palea with pistil, ventral view. —H, I. Glumes. J–L. Male spikelet. —J. Lemma. —K. Palea. —L. Palea with flower, ventral view.

Soderstrom & Calderón (Amazonian Colombia, the Surinam–French Guiana border, and Mato Grosso and Rondônia, Brazil), and 5–7 cm long, 17–26 mm wide in *A. bahiensis* Soderstrom & Zuloaga

(Bahia, Brazil, and Amazonas, Venezuela). The Venezuelan collection (Amazonas: near Terecay on Río Manapiare, 11 Oct. 1975, *Berry 1569* (MO, NY, VEN) represents the first report of *A. bahiensis*

besides the type. The following key to the species of *Arberella* is modified from Soderstrom & Zuloaga (1985):

- 1a. Inflorescences produced only from lowest and uppermost nodes of the leaf complement.
 - 2a. Leaves 10–22 per complement; blades 4–5 cm long, 5–8 mm wide; female spikelets 9.5–11 mm long; Costa Rica *A. costaricensis* (A. Hitchc.) Soderstrom & Calderón
 - 2b. Leaves 4–8 per complement; blades 10–14.5 cm long, 8–13 mm wide; female spikelets 18–20 mm long; Panama *A. lancifolia* Soderstrom & Zuloaga
- 1b. Inflorescences produced from all nodes of the leaf complement.
 - 3a. Female spikelet with rachilla internode between glumes and floret elongated; Panama *A. dressleri* Soderstrom & Calderón
 - 3b. Female spikelet with rachilla internode between glumes and floret not elongated; South America.
 - 4a. Leaf blades 4–5.5 cm long, 8–15 mm wide *A. flaccida* (Doell) Soderstrom & Calderón
 - 4b. Leaf blades 5–10.5 cm long, 17–35 mm wide.
 - 5a. Leaf blades 5–7 cm long, 17–26 mm wide *A. bahiensis* Soderstrom & Zuloaga
 - 5b. Leaf blades 8–10.5 cm long, 23–35 mm wide *A. venezuelae* Judziewicz & Davidse

Atractantha amazonica Judziewicz & L. G. Clark, sp. nov. TYPE: Brazil. Amazonas: Rio Marié ca. 40 km above confluence with Rio Negro, right bank beyond rapids and cachoeira, clumps at edge of river in igapó forest [ca. 0°35'S, 66°40'W], ca. 100 m, 10 Sep. 1979 (fl), K. Kubitzki, C. E. Calderón & H.-H. Poppendieck 79-222 (holotype, INPA; isotypes, B, CANB, COL, CTES, F, G, ISC, K, LE, MO, NY, P, PE, PRE, SI, SP, TULV, US, USCH, W, WIS). Figure 2.

Bambusa lignosa, caespitosa. Culmi usque ad 6 m longi, 4–8 mm diametro, scandentes, nutantes. Laminae foliorum 10–17 cm longae, 1–1.4 cm latae. Inflorescentia racemosa, 7–15 cm longa. Spiculae 1(–2)-flosculos habentes, alterum fertile, solitarium, alterum, cum praesenti, rudimentalem, in apice rachillae, in posteriore palea insertae; glumae 2, persistentes, membranaceae, subaristatae, prima 6–9 mm longa, 5-nervata, secunda 8–10 mm longa, 7-nervata; flosculus fertilis deciduus; lemma 18–23 mm longa, lineari-lanceolata, subfalcata, pungens, subaristata, coriacea, glabra, nitida, nervis extus vix vel haud manifestis.

Densely caespitose woody bamboo, the clumps to 1 m diam., with up to 20 culms per clump; rhizomes

not seen, presumably sympodial. Culms erect at first, later scandent and pendent, climbing in vegetation to at least 6 m; internodes hollow with a small lumen, cylindrical, glabrous, smooth, 4–8 mm diam., straight and rather rigid; nodal line slightly annular, corky, dark; bud solitary, positioned about 2–4 mm above the nodal line and terminal to a slight promontory. Bud at midculm node initially producing 3 subequal, widely spreading branches, these soon rebranching so that the upper portions of the culm appear to have 20–40 branches at each node. Culm leaves papery, stramineous, glabrous, deciduous, erect, appressed to culm; sheaths 7–9 × 2 cm, rounded on the back, confluent with the base of the much smaller blade; inner ligule 0.2–0.3 mm long, very oblique, rimlike, glabrous; oral setae and outer ligule absent; blades 3–5 × 1.5 cm, triangular, acute, erect, persistent. Foliage leaves in complements of 5–9; sheaths glabrous and rounded on the back below, prominently keeled at the summit, ciliolate on the margins; inner ligule ca. 0.5 mm long, membranous, brown; outer ligule rimlike, inconspicuous; oral setae 3–6 mm long, numerous, delicate, golden brown; pseudopetioles 1.5–3 mm long, glabrous, brownish, slightly winged, sometimes deflexed; blades 10–17 cm long, 1–1.4 cm wide, linear-lanceolate, acute to obtuse above the pseudopetiole, acuminate at the apex, glabrous, the upper surface slightly scaberulous near the base, the lower surface slightly whitened, the midnerve evident only in the lower 1/3 of the blade, the margins scabrous. Peduncles 5–13 cm long, slender, glabrous. Inflorescences abundantly produced, each consisting of 1(–2) spicate racemes terminal to leafy branches; racemes 7–15 cm long, alternately bearing 8–13 loosely overlapping, short-pedicelled spikelets, often twisted so that the spikelets appear to be secundly arranged; rachis glabrous, shiny; pedicels 0.5–1 mm long, indurate, stout, shiny. Spikelets 20–28 mm long, linear-lanceolate, coriaceous, nearly glabrous, loosely appressed to or slightly divergent from the rachis, 1- or rarely 2-flowered, the lower floret functional, if present the upper floret a tiny, long-pedicelled rudiment; glumes subequal, persistent, membranous, keeled above the middle, one or both short-awned, separated by a distinct internode ca. 1 mm long; lower glume 6–9 mm long (including awn), triangular-elliptical, rounded on the back, 5-nerved, the prominent, raised midnerve prolonged into an awn 1.5–3.5 mm long; upper glume 8–10 mm long, lanceolate-ovate, 7-nerved, the apex mucronate or prolonged into an awn up to 3 mm long; rachilla internodes separating the upper glume from the lower floret 2–3.5 mm long, persistent, slightly ob-



Figure 2. *Atractantha amazonica* (Davidse & Miller 26846, MO, except C, D, Rubitzki et al. 79-222, US). — A. Flowering branch complement. — B. Culm segment, showing bud. — C. Culm segment, showing leaf in situ. — D. Upper part of culm leaf. — E. Bases of foliage leaf blades, showing prominent oral setae. — F. Portion of inflorescence. — G. Spikelet, showing internode between glumes and floret. — H, I. Glumes. — J. Lemma. — K, L. Two views of palea, showing filiform rachilla prolongation and rudimentary upper spikelet.

cuneate at the apex; lower floret bisexual, 18–23 mm long, 1.2–2 mm wide, linear-lanceolate, slightly falcate, indurate, brownish, deciduous; lemma smooth, shiny, and obscurely nerved below, 7–11-nerved above with minutely ciliate margins, the base with a squat, peglike callus ca. 0.3 mm long, the apex pungent or the midnerve abruptly prolonged into an awn up to 3 mm long; palea slightly shorter to as long as the lemma, enclosed within it or prominently protruding, linear, 4-nerved, 2-keeled, the keels ciliate; lodicules not apparent; stamens 3, the anthers 4–10 mm long; gynoecium with ovary 1.5–2 mm long, stipitate, glabrous, the style 1, stigmas 2; rachilla internode (if present) slender, filiform, prolonged beyond the lower floret by 10–20 mm, tipped by a rudimentary spikelet up to 1.5 mm long. Mature caryopsis not seen.

Distribution and ecology. Known only from wet, lowland, seasonally flooded (igapó) forests along affluents of the Río Negro in southwestern Amazonas, Venezuela, and northwestern Amazonas, Brazil.

Additional specimens examined. VENEZUELA. AMAZONAS: Dept. Río Negro, middle part of Río Baria, margin of flooded forest around small laja, ca. 1°05'N, 66°25' W, elev. 80 m, 29 June 1984 (most sterile, one flowering), *Davidse & Miller 26846* (AAU, ANSM, BRI, CANB, CAY, COL, F, ISC, INPA, K, L, LE, MEXU, MG, MO, NY, PRE, RB, SI, US, VEN). BRAZIL. AMAZONAS: Rio Marié, 30–40 km above confluence with Rio Negro, near Macobeta village, climbing bamboo in forest on high river banks, in sandy soil [ca. 0°35'S, 66°40'W], elev. ca. 100 m, 9 Sep. 1979 (sterile), *Kubitzki, Calderón & Poppendieck 79-209* (B, INPA, ISC, K, LE, MO, NY, P, SI, SP, TULV, USCH, US).

Atractantha McClure (Bambuseae: Arthrostylidiinae) is a genus of 3–7 species hitherto thought to be endemic to the wet forests of Atlantic coastal Brazil in the states of Bahia and Espírito Santo (McClure, 1973). Along with *Alvimia* Soderstrom & Londoño and *Elytostachys* McClure, it is one of three arthrostylidioid genera thought to have pseudospikelets rather than true spikelets. *Atractantha amazonica* is the first species with true determinate spikelets in the genus, which joins *Raddia* Bertol. as one of only two bambusoid genera with a majority of species in eastern Brazil, and one disjunct Amazonian species.

The decision to describe this new bamboo in *Atractantha* rather than *Arthrostylidium* Rupr. may be controversial, since the presence of pseudospikelets versus true spikelets has traditionally been regarded as invariant at the generic level (McClure, 1973; Soderstrom & Ellis, 1987). However, it is possible that, by reduction, true spikelets may have evolved several times from pseudospikelets, and we choose to emphasize the distinctive and presumably

uniquely derived floret morphology shared by both the new species and previously described species of *Atractantha*. In all of them, each spikelet is 1- or occasionally 2-flowered, with a large, slender, spindlelike, falcate, indurate, obscurely nerved, pungent, brownish, functional lower floret, and if present, a tiny, rudimentary upper floret borne on an elongate, bristlelike prolongation of the rachilla. *Arthrostylidium* and *Atractantha* have very similar vegetative branching patterns in which a promontory produces numerous small branchlets. As traditionally conceived, *Arthrostylidium* has 3- to many-flowered spikelets lacking the specialized morphology of *Atractantha*.

A speculative hypothesis to explain the relationships between these genera is the following. The common ancestor of both genera had the distinctive promontoried branch-complement and inflorescences with many-flowered pseudospikelets with undifferentiated florets similar to those of *Guadua* Kunth. Two lines diverged, one leading to *Arthrostylidium*, which evolved true spikelets from pseudospikelets, the other leading to *Atractantha* (and perhaps also *Alvimia*), which first developed the distinctive spindle-shaped floret morphology while retaining the pseudospikelets (eastern Brazilian species of the genus). One offshoot of this line (*A. amazonica*) developed true spikelets, probably by reduction. Still, it is recognized that more anatomical and molecular data needs to be gathered on all the genera and monophyletic species groups within the Arthrostylidiinae before *A. amazonica* can be placed with certainty.

Aulonemia chimantaensis Judziewicz & Davidse, sp. nov. TYPE: Venezuela. Bolívar: Dist. Piar, altiplanicie en la base meridional de los farallones superiores del Apacará-tepui, “drier part of savanna bordering large swampy savanna,” 5°20'N, 62°12'W, ca. 2,200 m, 30 Jan.–1 Feb. 1983 (fl), *J. A. Steyermark, O. Huber & V. Carreño 128369* (holotype, MO; isotypes, ISC, K, SP, US, VEN). Figure 3G–J.

Culmi usque ad 1.5 m longi, erecti. Vaginae foliorum glabrae vel strigosae, fimbriatae ad apicem tantum; fimbriae 1–2 cm longae; laminae foliorum 11–14 cm longae, 1.3–2.5 cm latae, lanceolatae. Inflorescentia paniculata, 22–28 cm longa, ampla. Spiculae (1.3–)2.2–4 cm longae, 9–15-flosculos fertiles continentes; glumae purpureae, prima 1.5–2.7 mm longa, lanceolata, acuta, 1-nervata, secunda 3–4.5 mm longa, ovata, obtusa, 3- vel 5-nervata; lemmata fertilia (6–)8–10 mm longa, ovata vel elliptica, obtusa, tridentata, 7-nervata, viridescencia.

Woody bamboo; culms to 1.5 m long, erect, smooth. Culm leaves not seen. Midculm nodes bear-

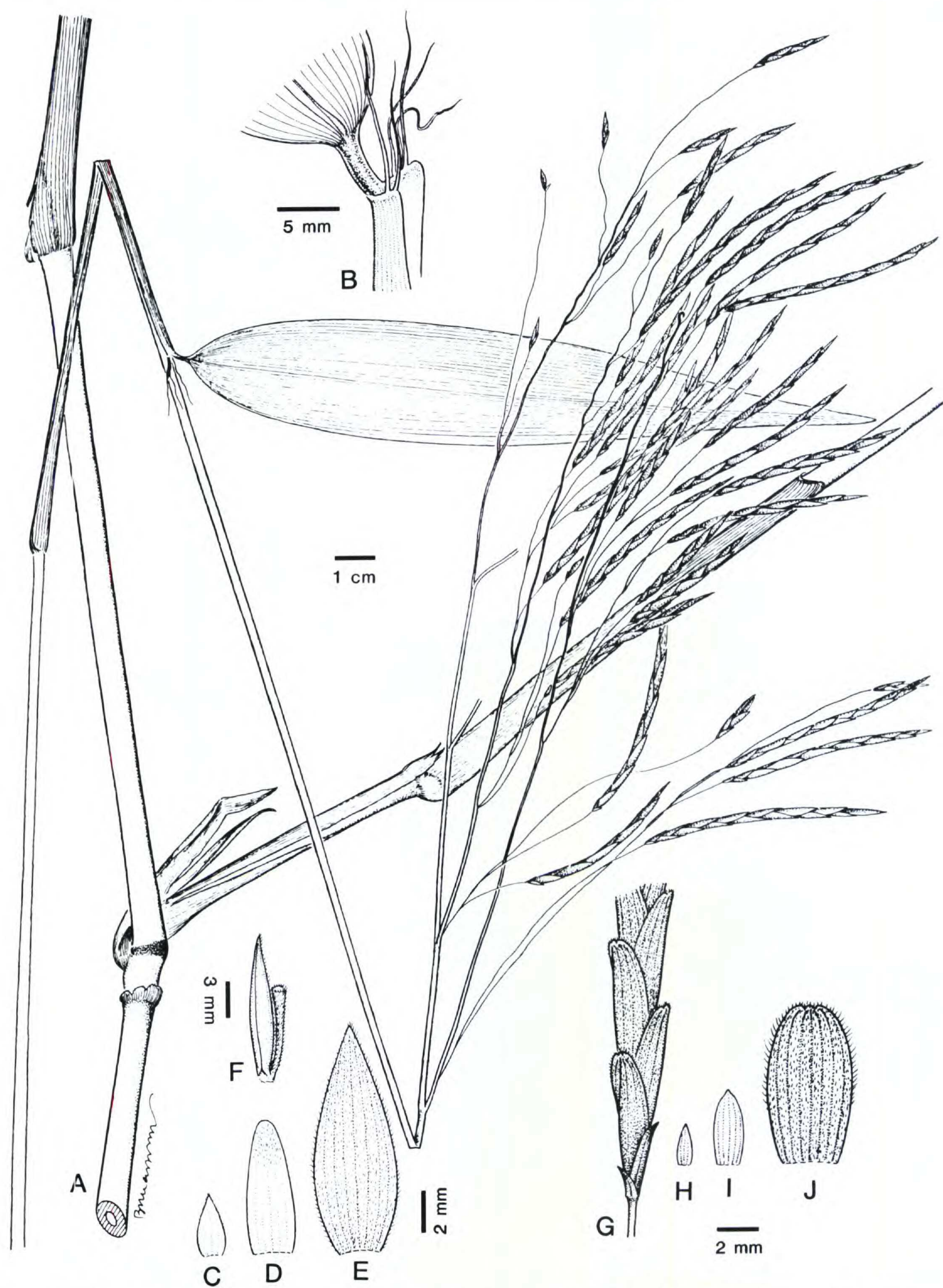


Figure 3. New species of *Aulonemia*. A-F. *A. jauaensis* (Steysmark 98093, MO). —A. Portions of flowering culm. —B. Foliage leaf blade base and sheath summit. —C. Lower glume. —D. Upper glume. —E. Lemma. —F. Floret and attached rachilla internode. G-J. *A. chimantaensis* (Huber & Steysmark 7037, MO). —G. Lower portion of spikelet. —H. Lower glume. —I. Upper glume. —J. Slightly tridentate lemma.

TABLE 1. Comparison of *Aulonemia jauaensis* with *A. chimantaensis*.

| | <i>A. jauaensis</i> | <i>A. chimantaensis</i> |
|------------------------------|---|--|
| Leaf blade length (cm) | 15–20 | 11–14 |
| Leaf blade width (cm) | 3–4.5 | 1.5–3.5 |
| Spikelet length (mm) | 20–70 | 13–40 |
| Florets per spikelet | (5–)11–23 | 9–15 |
| Lower glume length (mm) | 2.5–3.5 | 1.5–2.7 |
| Upper glume length (mm) | 5–6 | 3–4.5 |
| Functional lemma length (mm) | 10–13 | 6–10 |
| Functional lemma apex | acute | obtuse, often slightly tridentate |
| Lemma indument (dorsal) | ± densely covered with straggling, glassy hairs | glabrous or thinly covered with straggling, glassy hairs |

ing single, divergent branches. Foliage leaves with sheaths glabrous below, strigose on the back near the summit; oral setae 1–2 cm long, brown, few, restricted to the summit; outer ligule 0.3 mm long, indurate; inner ligule ca. 1 mm long, membranous; pseudopetioles 4–6 mm long, dark purple; blades 11–14 cm long, 1.5–3.5 cm wide, often deflexed, narrowly to broadly lanceolate, obtuse at the base, acuminate at the apex, glabrous above, puberulent and scaberulous beneath, the margins with scattered prickles. Peduncle 5–15 cm long, slender, antrorse-ly scabrous. Inflorescence 22–28 cm long, an open, ovoid panicle; branches 6–10 cm long, loosely as- cending, slender. Spikelets (1.3–)2.2–4 cm long, 1.8–2.5 mm wide, linear, slightly curving, densely 9–15-flowered, the florets imbricate; glumes pur- plish, firmly membranous, glabrous; lower glume 1.5–2.7 mm long, lanceolate, acute, slightly re- curved, 1-nerved; upper glume 3–4.5 mm long, ovate, obtuse, 3–5-nerved; lowest floret sterile, pur- plish, consisting of only a lemma, this 4.5–6 mm long, ovate, acute, 3–5-nerved; functional florets with lemmas (6–)8–10 mm long, 1.5–2 mm wide (folded width), ovate, obtuse to slightly tridentate, 7-nerved, greenish, glabrous on the back or thinly covered with straggling, glassy hairs 0.2–0.3 mm long, the margins with short, spreading cilia; paleas 7–9 mm long, 1.5 mm wide between the ciliolate keels, nearly as long as but still concealed by the lemma, slightly notched at the apex; rachilla inter- nodes 2–3 mm long, ca. 0.5 mm wide; lodicules 3, 0.9–1 mm long, spatulate, hyaline, several-nerved, short-pilose at the apex; stamens 3, the anthers 2.5– 3.3 mm long, yellow; gynoecium not seen. Fruit not seen.

Distribution. Known only from the summit of Apacará-tepui, Chimantá Massif, Bolívar, Venezue- la.

Additional specimens examined. VENEZUELA. BOLÍVAR: Dist. Piar, Chimantá Massif, altiplanicie en la base meridional de los farallones superiores del Apacará- tepui, frecuente en matorral en el fondo del valle, 5°20'N, 62°12'W, ca. 2,200 m, 30 Jan.–1 Feb. 1983 (fl), *Huber & Steyermark 7037* (MO, VEN); Dist. Piar, altiplanicie en la base meridional de los farallones superiores del Apacará-tepui, “drier part of savanna bordering large swampy savanna,” 5°20'N, 62°12'W, ca. 2,200 m, 30 Jan.–1 Feb. 1983 (fl), *Steyermark et al. 128370* (MO); Chimantá Massif, sección SE del Apacará-tepui, 5°19'N, 62°07'W, ca. 2,150 m, 6–9 Feb. 1984 (st), *Huber, Colella & Vareschi 8905* (MO, US).

Aulonemia Goudot (Bambuseae: Arthrostylidi- inae) is a genus of about 30 described and several undescribed species that ranges from southern Mex- ico and northern South America to Bolivia and south- ern Brazil, at 500 to 3,500 m. It is usually char- acterized by a branching pattern with one large branch dominant at each midculm node; foliage leaves with prominent oral setae and broad, deflexed blades; and open panicles of slender spikelets. Both *A. chi- mantaensis* and the following species (*A. jauaensis*) appear to be distinctive within the genus because of their very long spikelets with contrasting purple glumes and numerous, greenish, densely imbricate florets. Table 1 summarizes the differences between the two new species.

Two other species of *Aulonemia* have previously been described from the Guayana Highlands: *A. deflexa* (N. E. Brown) McClure (Mt. Roraima, Ilu- tepui) and *A. steyermarkii* (McClure) McClure (Ptari- tepui, Ilu-tepui, and Mt. Roraima). Both differ from *A. chimantaensis* and *A. jauaensis* in their smaller, fewer and more loosely flowered, purple spikelets less than 2 cm long. Also, sterile collections of at least four more species of *Aulonemia* from the Gua- yana Highlands have been examined, but all have distinctive vegetative features that make them un-

likely to be closely related to *A. chimantaensis* and *A. jauaensis*.

Aulonemia jauaensis Judziewicz & Davidse, sp. nov. TYPE: Venezuela. Bolívar: Cerro Jaua, cumbre de la porción Central-Occidental de la Meseta, 4°45'N, 64°26'W, 60 km NW de la misión de Campamento Sanidad del Río Kanarakuni, 1,922–2,100 m, 22–27 Mar. 1967 (fl), *J. A. Steyermark* 98093 (holotype, US; isotypes, F, NY). Figure 3A–F.

Culmi usque ad 1 cm diametro, 10 m longi, scandentes. Vaginae foliorum glabrae, fimbriatae ad apicem tantum; fimbriae 1–2 cm longae; laminae foliorum 15–20 cm longae, 3–4.5 cm latae, lanceolato-ovatae. Inflorescentia paniculata, 25–30 cm longa, ampla. Spiculae (2–)4–7 cm longae, (5–)11–23-flosculos fertiles continentes; glumae purpureae, prima 2.5–3 mm longa, 1– vel 3-nervata, secunda 5–6 mm longa, 5– vel 7-nervata; lemmata fertilia 10–13 mm longa, ovata, acuta, 7– vel 9-nervata, viridescentia.

Slender, scandent woody bamboo; culms up to 10 m long, 1 cm diam., glabrous, smooth, with a lumen ca. $\frac{1}{3}$ the diameter of the culm. Culm leaves not seen. Midculm nodes bearing single, stout, divergent branches each bearing a prophyll 3–4 cm long. Foliage leaves with sheaths (including margins) glabrous; oral setae 1–2 cm long, brown, few, restricted to the sheath summit; outer ligule 0.3 mm long, rimlike; inner ligule 0.5–0.7 mm long, membranous; pseudopetioles 3–6 mm long, dark purple; blades 15–20 cm long, 3–4.5 cm wide, lanceolate-ovate, acute to obtuse at the base, acuminate at the apex, slightly lighter beneath, glabrous or finely scabrid-puberulent beneath. Peduncle 25–30 cm long, slender. Inflorescence 25–30 cm long, an open, ovoid panicle; branches 8–12 cm long, loosely ascending, slender, stiff, scaberulous. Spikelets (2–)4–7 cm long, 2–3.5 mm wide, linear, slightly curving, the bracts \pm densely covered throughout with straggling, glassy hairs 0.2–0.3 mm long, densely (5–)11–23-flowered, the florets imbricate; glumes purplish, firmly membranous; lower glume 2.5–3 mm long, lanceolate, acute, slightly recurved, 1–3-nerved; upper glume 5–6 mm long, ovate, acute to obtuse, 5–7-nerved; lowest floret sterile, consisting only of a lemma, this 7–8 mm long, ovate, acute, 3–5-nerved; functional florets with lemmas 10–13 mm long, ca. 2 mm wide (folded width), ovate, acute, 7–9-nerved, greenish; paleas concealed by the lemmas, 7–8 mm long, 1.5 mm wide between the ciliate keels, slightly notched at the apex; rachilla internodes 3–4 mm long, ca. 0.5 mm wide; lodicules, androecium, gynoecium, and fruit not seen.

Distribution. Known only from the type collection on the summit of Cerro Jaua, Bolívar, Venezuela.

This species is apparently closely related to the also newly described *Aulonemia chimantaensis*; the two are compared in Table 1.

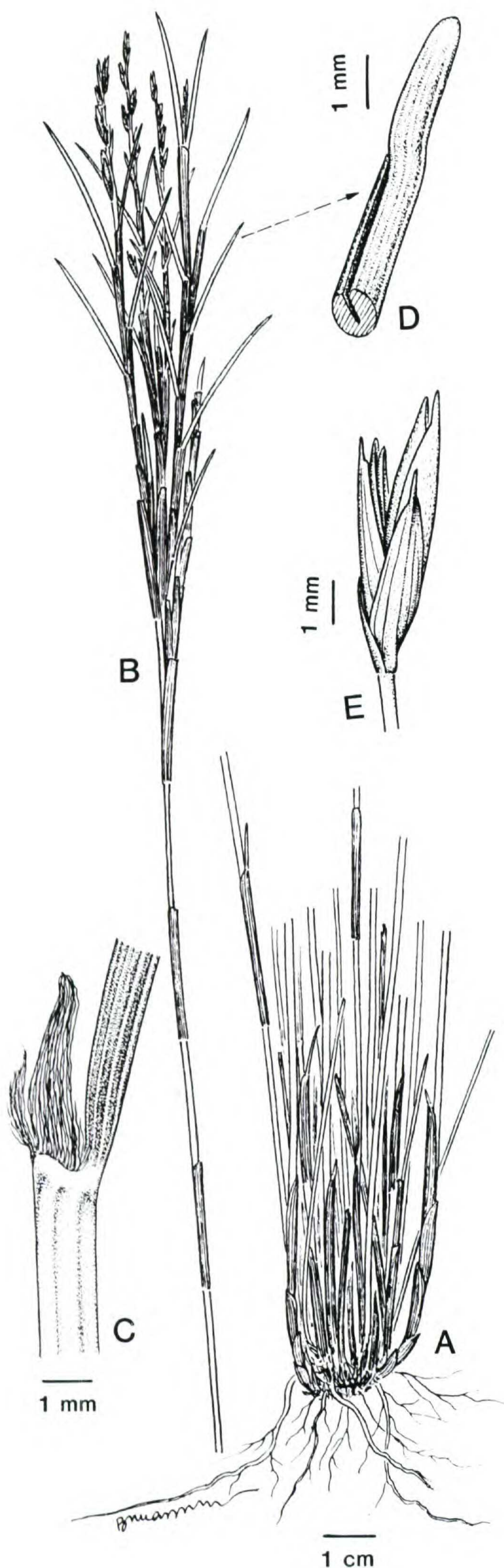
Myriocladus involutus Judziewicz & Davidse, sp. nov. TYPE: Venezuela. Bolívar: Dept. Piar, Chimantá Massif, frequent, rocky escarpment between W and E branches of the headwaters of the Río Tirica, 2,260 m, 13 Feb. 1955 (fl), *J. A. Steyermark* & *J. J. Wurdack* 819 (holotype, NY; isotype, F). Figure 4.

Bambusa lignea humilis Myrioclado steyermarkii Swallen affinis, sed laminis longioribus (4.5–6.5 cm) angustioribus (0.7–1.5 mm) involutis differt.

Dwarf woody bamboo up to 1 m tall forming dense colonies by short, pachymorph rhizomes. Culms erect, unbranched below, glabrous; internodes 2.5–8 cm long in lower portion of culm, gradually shortening to 0.5 cm in upper portion. Leaves with sheaths broadest near summit (folded width 2 mm), glabrous, smooth, shiny, apparently glaucous, rounded to somewhat keeled on the back; inner ligule 0.1 mm long, ciliate; outer ligule a minute rim; oral setae apparently represented by a dense mat of 3–5-mm-long, very fine, white, matted cilia; pseudopetiole ca. 1 mm long; blades strongly ascending, 4.5–6.5 cm long, 0.7–1.5 mm wide (rolled width), involute, glabrous, glaucous, the apex obtuse. Culms often rebranching in upper portion of leaf complement, each branch terminating in an inflorescence; inflorescence a spicate raceme 2.5–3.5 cm long bearing 4–7 spikelets, the rachis angled, glabrous, scabrous. Spikelets 7–8 mm long, dark purplish brown, with scattered minute, stiff hairs; lower glume 2–2.5(–3.5) mm long, lanceolate-ovate, obtuse to acute; upper glume 3.2–4(–5.5) mm long, lanceolate, 1(–3)-nerved, the midnerve prominent and slightly excurrent; lowest floret 4.5–5 mm long, lanceolate, sterile, lacking a palea or flower; fertile florets 2, 6–7 mm long, lanceolate; rachilla prolonged 2 mm past upper fertile floret and bearing a rudimentary spikelet 3 mm long; lodicules, androecium, and gynoecium not seen. Caryopsis 4 \times 1 mm, pyriform, acute, dark purplish brown, terete; hilum linear; embryo 0.6 mm long, basal.

Distribution. Endemic to the summit of Apacará-tepui, Chimantá Massif, Bolívar, Venezuela.

Additional specimen examined. VENEZUELA. BOLÍVAR: Chimantá Massif, valle amplio ubicado en la sección SE de Apacará-tepui, 5°19'N, 62°07'W, 2,150



m, estéril, 6–9 Feb. 1984, formando densas colonias en el estrato herbáceo en comunidades de *Chimantaea mirabilis*, Huber, Colella & Vareschi 8858 (MO, MYF, NY, US).

Myriocladus Swallen (Bambuseae: Arthrostylidiinae) is a genus of 13 species endemic to the upper slopes and summits of tepuis in southern Venezuela and adjacent Brazil (Soderstrom et al., 1988). This new species, named for its very narrow, involute leaf blades, is apparently most closely related to *M. steyermarkii*, which differs in its larger, flat leaf blades 1–3 cm long and 1.5–3.5 mm wide, and in the absence of fine, white, matted oral setae at the summit of the leaf sheath. Both species are unusual in the genus in their dwarf stature, equal-sized culm internodes, and small, few-flowered, racemose inflorescences. *Myriocladus steyermarkii* (including *M. gracilis* Swallen, here regarded as a synonym) is a commoner species known from over a dozen collections at 1,900 to 2,500 m on Chimantá Massif.

Steyermark & Wurdack 819 is a mixed collection. The US sheet is the holotype of *M. steyermarkii* Swallen and closely matches the author's description and illustration; however, the F and NY specimens are *M. involutus*.

***Rhipidocladum sibilans* Davidse, Judziewicz, & L. G. Clark, sp. nov.** TYPE: Venezuela. Anzoátegui: Dist. Libertad, road from El Vigia to Buenos Aires, 10°01'N, 64°13'W, 1,000 m, 27 Nov. 1981, G. Davidse & A. C. González 19490 (holotype, MO; isotypes, COL, ISC, K, MEXU, US, VEN). Figures 5, 6.

Bambusa lignosa; culmi 4–8 m longi, cylindrati, cavi, ad 1.5 cm diametro. Ramuli floriferi 150–200 in quoque nodum, 11–18(–35) cm longi; folia ramulorum 5–7; laminae 5–7 cm longae, 1.8–2.7(–3.5) mm latae, lineare, planae. Inflorescentia racemosa, tenua. Spiculae 2–3, 2–4 cm longae; gluma prima 5–10 mm longa; secunda 8–14 mm longa, arista 4–6 mm longa; lemmata sterilia 2, 11–13 mm longa, aristae 4–6 mm longae; lemma fertile glabra, 7–15-nervata, arista 4–6 mm longa; flosculi rudimentarii 3(–4).

Caespitose woody bamboo. Culms 4–8 m tall, to 1.5 cm diam., smooth, shiny, hollow, weak, the walls ca. 1 mm thick. Culm leaves with sheaths ca. 10 cm long, 6–7 cm wide at the base, erect, clasping the culm, narrowly triangular, abaxially glabrous, adaxially sparsely pubescent above, densely pubescent basally, or occasionally glabrous. Midculm nodes

Figure 4. *Myriocladus involutus* (Steyermark & Wurdack 819, NY). —A. Plant base. —B. Flowering shoot. —C. Leaf ligular region. —D. Apex of leaf blade. —E. Spikelet.

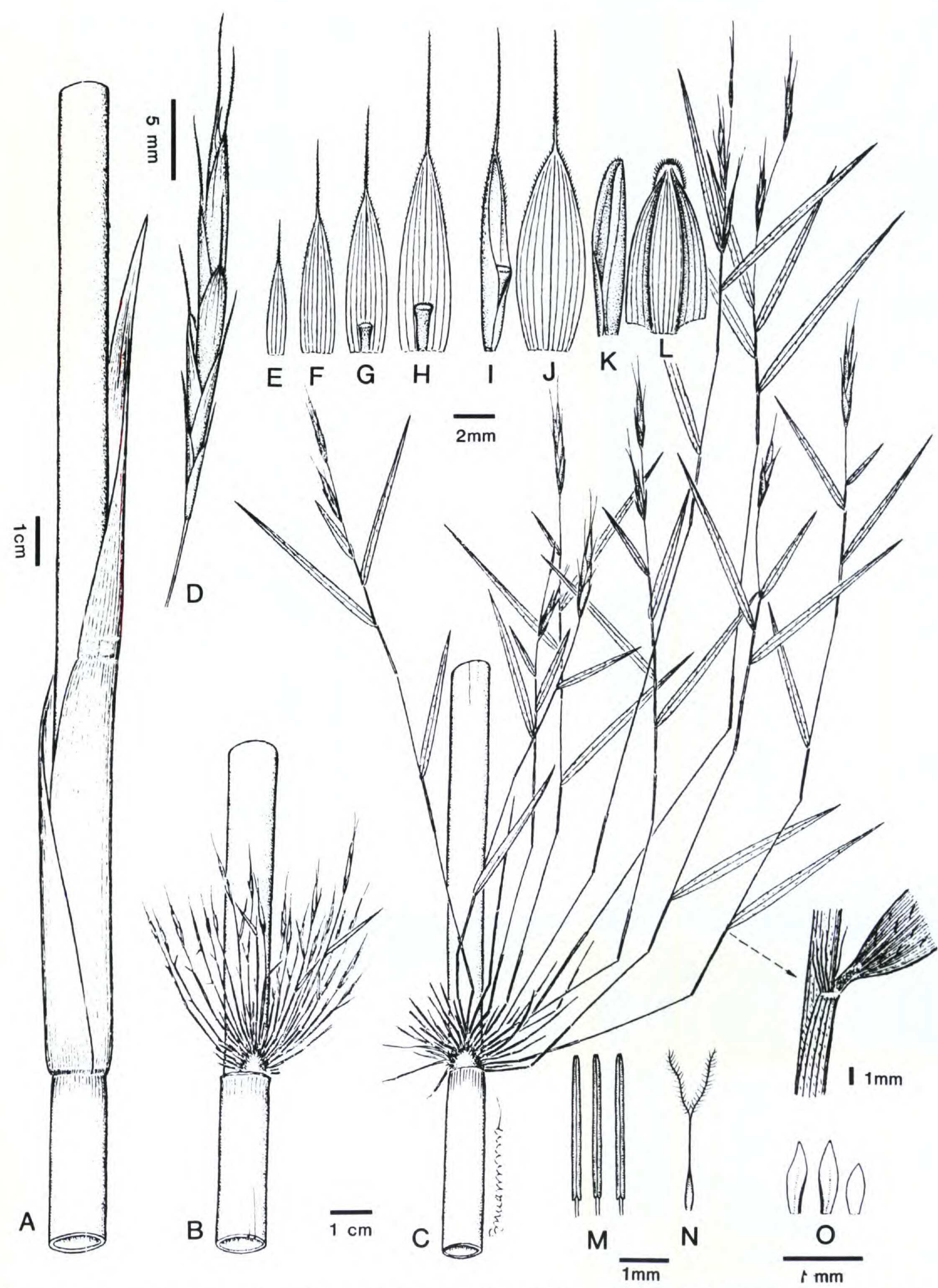


Figure 5. *Rhipidocladum sibilans* (Davidse & González 19490, MO). —A. Culm with leaf in situ. —B. Flowering young branch complement. —C. Flowering mature branch complement. —D. Spikelet. —E, F. Glumes. —G, H. Sterile florets. —I, J. Functional lemmas. —K, L. Palea. —M. Stamens. —N. Gynoecium. —O. Lodicules.



Figure 6. Habit of *Rhipidocladum sibilans* at type locality in Anzoátegui, Venezuela (Davidse & González 19490); note the young shoots in the foreground.

with 150–200 subsidiary branches per complement; subsidiary branches 11–18 cm long (to 35 cm long on some flowering branches), 1–1.5 mm wide, smooth, the distal portion clothed in bladeless sheaths, these sparingly to densely pubescent, especially on the margins, the apical portions less pubescent, bearing a complement of 5–7 blades. Foliage leaves with sheaths nearly glabrous to densely puberulent, especially on the margins; outer ligule minute; inner ligule less than 0.2 mm long, membranous; oral setae 1–3 mm long, few, delicate; pseudopetioles 0.7–1.3 mm long, nearly glabrous; blades 5–7 cm long, 1.8–2.7(–3.5) mm wide (occasionally 2 cm long and 1.5 mm wide on some flowering branches), linear, flat, the upper surface glabrous, the lower surface glabrous to short-pilose, the margins scabrous near the apex. Inflorescences terminating leafy subsidiary branchlets, 5–8 cm long, slightly curving, bearing 2–3 ascending, subsessile spikelets on pedicels with densely pubescent apices. Spikelets (including awns) 2–4 cm long, 4–7-flowered, terete, the bracts all bearing scabrous awns 4–6 mm long; glumes stramineous, the lower 5–10 mm long (including awn),

linear-lanceolate, the upper 8–14 mm long, lanceolate; upper glume separated from lower sterile floret by an internode ca. 8 mm long; sterile florets 2, 11–13 mm long, lanceolate, 5–7-nerved, the nerves obscure at the base, prominent at the puberulent apex; functional florets 2(–3), 12–15 mm long, light green mottled with darker spots, scabrous; lemmas lanceolate, 7-nerved, pubescent at the apex, the margins near the base overlapping, ciliate; paleas nearly as long as the lemmas, 4-nerved, 2-keeled; lodicules 3, narrowly ovate, acuminate, glabrous, obscurely several-nerved, the posterior 0.7 mm long, the anterior pair 0.9 mm long; stamens 3, the anthers 2.5–3 mm long, linear; gynoecium with ovary glabrous, style 1, stigmas 2, hispid; rachilla internodes 3–4 mm long, puberulent, the apex cupulate, ciliate; 3(–4) uppermost florets progressively reduced and sterile, all awned. Fruit not seen.

Distribution and ecology. Endemic to eastern Venezuela (Anzoátegui, Bolívar, and Sucre), and perhaps adjacent Guyana, in forests or at forest margins from 900 to 1,220 m. The type was collected from a population in which all plants were in flower.

Additional specimens examined. VENEZUELA. ANZOÁTEGUI: Dist. Bolívar, just S of El Zamuro, Fila El Purgatorio, 10°02'N, 64°17'W, 1,100 m, 24 Nov. 1981 (fl), Davidse & González 19305 (ISC, MO, US, VEN). BOLÍVAR: Gran Sabana, ca. 10 km SW of Karaurín, at junction of Ríos Karaurín and Asadón (Río Sanpa), streambank in forest, 5°19'N, 61°03'W, 900–1,000 m, 26 Apr. 1988 (st), Liesner 23869 (COL, ISC, K, MO, TULV, US, VEN); along Río Karuai, at base of Sororopántepeui, W of La Laja, 1,220 m, 29 Nov. 1944 (st), Steyermark 60759 (F, US); “Arapoo” River, Mt. Roraima Expedition [perhaps in Guyana], Oct. 1884 to Jan. 1885 (st), Im Thurn 18 (BRG, US). SUCRE: Los Altos, Jan. 1942 (st), Tamayo 2124 (US).

The very sparsely flowered, nonsecund inflorescences with slender, terete, awned spikelets of the new species are unusual in *Rhipidocladum* McClure (Arthrostylidiinae), a widespread but tropical American genus of about 20 species (McClure, 1973).

The closest relative of *R. sibilans* appears to be *R. panamense* R. W. Pohl, a Panamanian endemic (Pohl, 1985). Both taxa have extremely narrow leaf blades, but *R. sibilans* differs from the latter species in its fewer-flowered (2–3 vs. 5–7) inflorescences with longer (2–4 cm vs. 1.2–1.6 cm), more slender spikelets. Vegetatively the two species are similar, and some sterile Colombian material (e.g., Pennell & Killip 8320, US) cannot be definitely named.

Julian A. Steyermark noted on the label of his collection number 60759 that the local name for this bamboo is *murok-wayi-yek*, and that Amerindians manufacture whistles about 25 cm long and

7 mm diam. from the hollow culm internodes. The specific epithet is derived from the Latin *sibilus* (pipe or whistle), and alludes to this use.

Acknowledgments. This work was completed at the Missouri Botanical Garden as part of the *Flora of the Venezuelan Guayana* project. We thank Bruno Manara for the illustrations and assistance with the Latin descriptions, the curators of F, NY, US, and VEN for loans of herbarium material, and Paul E. Berry and an anonymous reviewer for critically reading the manuscript.

Literature Cited

- McClure, F. A. 1973. Genera of bamboos native to the New World (Gramineae: Bambusoideae). *Smithsonian Contr. Bot.* 9: i-xii, 1-148. [Edited by T. R. Soderstrom.]
- Pohl, R. W. 1985. Three new species of *Rhipido-cladum* from Mesoamerica. *Ann. Missouri Bot. Gard.* 72: 272-276.
- Soderstrom, T. R. & C. E. Calderón. 1979. *Arberella* (Poaceae: Bambusoideae): A new genus from tropical America. *Brittonia* 31: 433-445.
- & R. Ellis. 1987. The position of bamboo genera and allies in a system of grass classification. Pp. 225-238 in T.R. Soderstrom et al. (editors), *Grass Systematics and Evolution*. Smithsonian Institution Press, Washington, D.C. [Proceedings of the International Symposium on Grass Systematics and Evolution. Washington, D.C., 27-31 July 1986.]
- & F. O. Zuloaga. 1985. New species of grasses in *Arberella*, *Cryptochloa*, and *Raddia* (Poaceae: Bambusoideae: Olyreae). *Brittonia* 37: 22-35.
- , E. J. Judziewicz & L. G. Clark. 1988. Distribution patterns of neotropical bamboos. Pp. 121-157 in P. E. Vanzolini & R. E. Heyer (editors), *Proceedings of a Workshop on Neotropical Distribution Patterns*. Academia Brasileira de Ciencias, Rio de Janeiro.